

Appl. No. 09/480,986
Amdt. dated [insert date]
Reply to Office Action of February 4, 2004

PATENT

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings of claims in the application:

Listing of Claims:

1. (Currently Amended) A method for operating a display having a plurality of pixel elements, comprises:

- a) applying a single transition voltage to the plurality of pixel elements via transistors uniquely coupled to pixel electrodes on the display during a first period of time within a first field time, each pixel element including a liquid crystal material having at least a first state and a second state, wherein a transition of the liquid crystal material from the first state to the second state has an associated first transition time, wherein a transition of the liquid crystal material from the second state to the first state has an associated second transition time, wherein the first transition time is longer than the second transition time, and wherein the single transition voltage induces liquid crystal material in each pixel element to begin transitioning to the second state; thereafter
- b) while each pixel element is transitioning to the second state, applying a first paint voltage to one pixel element of the plurality of pixel elements during a second period of time within the first field time, wherein the first paint voltage induces liquid crystal material in the one pixel element to a third state; thereafter
- c) waiting a predetermined time period within the first field time; thereafter
- d) illuminating the one pixel element within the first field time; thereafter
- e) applying the single transition voltage to the plurality of pixel elements via the pixel electrodes on the display during a first period of time within a second field time; thereafter
- f) applying a second paint voltage to the one pixel element elements during a second period of time within the second field time, wherein the second paint voltage induces the liquid crystal material in the one pixel element to a fourth state; thereafter

Appl. No. 09/480,986

PATENT

Amdt. dated [insert date]

Reply to Office Action of February 4, 2004

g) waiting the predetermined time period within the second field time; and thereafter

h) illuminating the one pixel element within the second field time;
wherein the single transition voltage is between the first paint voltage and the second paint voltage.

2. (Previously Amended) The method of claim 1 wherein d) comprises illuminating the one pixel element with an illumination source of a first color within the first field time, and h) comprises illuminating the one pixel element with an illumination source of a second color within the second field time.

3. (Previously Amended) The method of claim 1 further comprising after h):

i) applying the single transition voltage to the plurality of pixel elements via the pixel electrodes on the display during a first period of time within a third field time, wherein the transition voltage induces liquid crystal material in each pixel element to begin transitioning to the second state; thereafter

j) applying a third paint voltage to the one pixel element elements during a second period of time within the third field time, wherein the third paint voltage induces the liquid crystal material in the one pixel element to a fifth state; thereafter

k) waiting the predetermined time period within the third field time; and thereafter

l) illuminating the one pixel element within the third field time,
wherein d) comprises illuminating the one pixel element with an illumination source of a first color within the first field time, h) comprises illuminating the one pixel element with an illumination source of a second color within the second field time, and l) comprises illuminating the one pixel element with an illumination source of a third color within the third field time.

Appl. No. 09/480,986
Amdt. dated [insert date]
Reply to Office Action of February 4, 2004

PATENT

4. (Original) The method of claim 3 wherein the first color, the second color, and the third color are selected, without replacement, from the group: red color, green color, blue color.

5. (Previously Amended) The method of claim 1 wherein d) and h) both comprise illuminating the one pixel element with an illumination source.

6. (Previously Amended) The method of claim 1 wherein applying the single transition voltage to the plurality of pixel elements comprises applying the single transition voltage to all of the plurality of pixel elements at one time while holding a common electrode at a constant value.

7. (Previously Amended) The method of claim 1 wherein applying the single transition voltage to the plurality of pixel elements during the first period of time within the first field time comprises:

applying the single transition voltage to a first row of pixel elements from the plurality of pixel elements while holding a common electrode at a constant value; and thereafter

applying the single transition voltage to a second row of pixel elements from the plurality of pixel elements while holding the common electrode at a constant value.

8. (Previously Amended) The method of claim 1 wherein applying the single transition voltage to the plurality of pixel elements during the first period of time within the first field time comprises:

applying the single transition voltage to a first column of pixel elements from the plurality of pixel elements while holding a common electrode at a constant value; and thereafter

applying the single transition voltage to a second column of pixel elements from the plurality of pixel elements while holding the common electrode at a constant value.

9. (Currently Amended) A display having a plurality of pixel elements comprises:

Appl. No. 09/480,986

PATENT

Amtd. dated [insert date]

Reply to Office Action of February 4, 2004

a transaction circuit coupled to each pixel element in the plurality of pixel elements, the transaction circuit configured to apply a first transition voltage to the plurality of pixel elements via drive transistors individually coupled to pixel electrodes during a first time period within a first field time and a second transition voltage to the plurality of pixel elements via drive transistors individually coupled to pixel electrodes during a first time period within a second field time, each pixel element including a liquid crystal material having at least a first state and a second state, wherein a transition of the liquid crystal material from the first state to the second state has an associated first transition time, wherein a transition of the liquid crystal material from the second state to the first state has an associated second transition time, wherein the first transition time is longer than the second transition time, wherein the first transition voltage induces liquid crystal material in each pixel element to begin transitioning to the second state within the first field time, and wherein the second transition voltage induces the liquid crystal material in each pixel element to begin transitioning to the second state within the second field time;

E/C
a paint circuit coupled to the transaction circuit, the paint circuit configured to apply, while each pixel element is transitioning to the second state, a first paint voltage during a second time period within the first field time and a second paint voltage during a second time period within the second field time to one pixel element from the plurality of pixel elements after the single transition voltage is applied to the plurality of pixel elements, wherein the first paint voltage induces liquid crystal material in the one pixel element to a third state, and wherein the second paint voltage induces the liquid crystal material in the one pixel element to a fourth state;

a timer circuit coupled to the paint circuit, the timer circuit configured to determine when a predetermined time period has elapsed;

an illumination circuit coupled to the timer circuit, the illumination circuit configured to illuminate the one pixel element after the predetermined time period has elapsed within the first field time and within the second field time;

wherein the first transition voltage is applied to the plurality of pixel elements during the first time period within the first field time before the first paint voltage is applied to the plurality of pixel elements during the second time period within the first field time, and

Appl. No. 09/480,986

PATENT

Amtd. dated [insert date]

Reply to Office Action of February 4, 2004

wherein the second transition voltage is applied to the plurality of pixel elements during the first time period within the second field time after the one pixel element is illuminated within the first field time and before the second paint voltage is applied to the plurality of pixel elements during the second time period within the second field time.

10. (Previously Amended) The display of claim 9

wherein the illumination circuit is configured to illuminate the one pixel element with a first color within the first field time after the first paint voltage is applied to the one pixel element, and

wherein the illumination circuit is configured to illuminate the one pixel element with a second color within the second field time after the second paint voltage is applied to the pixel element.

11. (Previously Amended) The display of claim 9

wherein the paint circuit is also configured to apply a third paint voltage to one pixel element from the plurality of pixel elements during a second time period within a third field time after the first transition voltage is applied to the plurality of pixel elements during a first time period within the third field time, wherein the third paint voltage induces the liquid crystal material in the one pixel element to a fifth state;

wherein the first transition voltage is applied to the plurality of pixel elements within the first time period with the third field time after the one pixel element is illuminated during the second field time;

wherein the illumination circuit is configured to illuminate the one pixel element with a first color within the first field time after the first paint voltage is applied to the plurality of pixel elements;

wherein the illumination circuit is configured to illuminate the one pixel element with a second color within the second field time after the second paint voltage is applied to the plurality of pixel elements; and

Appl. No. 09/480,986

Amtd. dated [insert date]

Reply to Office Action of February 4, 2004

PATENT

wherein the illumination circuit is configured to illuminate the one pixel element with a third color within the third field time after the third paint voltage is applied to the plurality of pixel elements.

12. (Original) The display of claim 11 wherein the first color, the second color, and the third color are selected, without replacement, from the group: red color, green color, blue color.

13. (Original) The display of claim 9 wherein the illumination circuit comprises a monochromatic illumination source.

14. (Previously Amended) The display of claim 9 wherein applying the first transition voltage to the plurality of pixel elements during the first time period within the first field time comprises applying the first transition voltage to all of the plurality of pixel elements at one time while holding a common electrode at a constant value ; and

wherein the first transition voltage and the second transition voltage are between the first paint voltage and the second paint voltage.

15. (Previously Amended) The display of claim 9 wherein the transaction circuit is configured to apply the first transition voltage to a first row of pixel elements from the plurality of pixel elements while holding a common electrode at a constant value before a second row of pixel elements from the plurality of pixel elements during the first time period.

16. (Previously Amended) The display of claim 9 wherein the transaction circuit is configured to apply the first transition voltage to a first column of pixel elements from the plurality of pixel elements while holding a common electrode at a constant value before a second column of pixel elements from the plurality of pixel elements during the first time period.

Appl. No. 09/480,986

Amdt. dated [insert date]

Reply to Office Action of February 4, 2004

PATENT

17. (Currently Amended) A circuit for driving a liquid crystal display

having a plurality of pixels comprises:

an initializing circuit coupled to the plurality of pixels configured to apply a first voltage to the plurality of pixels via drive transistors uniquely coupled to each of a plurality of pixel electrodes during a first time period of a first field and configured to apply a second voltage to the plurality of pixels via drive transistors uniquely coupled to each of the plurality of the pixel electrodes during a first time period within a second field, each pixel including a liquid crystal material having at least a first state and a second state, wherein a transition of the liquid crystal material from the first state to the second state has an associated first transition time, wherein a transition of the liquid crystal material from the second state to the first state has an associated second transition time, wherein the first transition time is longer than the second transition time, and wherein the single transition voltage induces liquid crystal material in each pixel to begin transitioning to the second state;

a driving circuit coupled to the initializing circuit configured to apply a first drive voltage during a second time period within the first field after the first time period within the first field, and a second drive voltage during a second time period within the second field after the first time period within the second field, wherein the first drive voltage induces the liquid crystal material in the one pixel to a third state, and wherein the second drive voltage induces the liquid crystal material in the one pixel to a fourth state; and

an illumination circuit coupled to the driving circuit configured to illuminate the pixel for a predetermined time period within the first field and within the second field after the pixel has been driven with the first drive voltage and after the pixel has been driven with the second drive voltage, respectively.

18. (Currently Amended) The circuit of claim 17

wherein the illumination circuit is configured to illuminate the pixel with a first color within the first field after the first drive voltage has been applied to the pixel, and

wherein the illumination circuit is configured to illuminate the pixel with a second color within the second field after the second drive voltage has been applied to the pixel ;

Appl. No. 09/480,986
Amdt. dated [insert date]
Reply to Office Action of February 4, 2004

PATENT

wherein the first transition voltage and the second transition voltage are have substantially similar amplitudes.

19. (Previously Amended) The circuit of claim 18 wherein the first color and the second color are selected, without replacement, from the group: red color, green color, blue color.

20. (Previously Amended) The circuit of claim 17 wherein the initializing circuit is configured to apply a first voltage to all of the pixels in the plurality of pixels at one time while holding a common electrode at a constant value.

21. (Previously Amended) The circuit of claim 17 wherein the first voltage is between the first drive voltage and the second drive voltage.

22. (Currently Amended) A method for operating a liquid crystal display comprises:

applying a first voltage via drive transistors uniquely coupled to pixel electrodes of a plurality of pixels of the liquid crystal display to initiate a transition of liquid crystal material in the plurality of pixels to a clear state within a first color field; thereafter

applying a first drive voltage via a drive transistor uniquely coupled to a pixel electrode of at least one pixel of the plurality of pixels to initiate a transition of liquid crystal material in at least one pixel into a second state within the first color field; thereafter

illuminating at least the one pixel within the first color field.

23. (Previously Amended) The method of claim 22 wherein applying the first voltage to the plurality of pixel electrodes of the plurality of pixels comprises applying the first voltage to pixel electrodes of the plurality of pixels at one time.

24. (Previously Amended) The method of claim 22 wherein applying the first voltage to the plurality of pixel electrodes of the plurality of pixels comprises:

applying the first voltage to pixel electrodes of the pixels along a first row of pixels from the plurality of pixels; and thereafter

Appl. No. 09/480,986
Amdt. dated [insert date]
Reply to Office Action of February 4, 2004

PATENT

applying the first voltage to pixel electrodes the pixels along a second row of pixels from the plurality of pixels

25. (Currently Amended) The method of claim 22 wherein applying the first voltage via drive transistors uniquely coupled to the plurality of pixel electrodes of the plurality of pixels comprises:

applying the first voltage via drive transistors uniquely coupled to pixel electrodes of the pixels along a first column of pixels from the plurality of pixels; and thereafter

applying the first voltage via drive transistors uniquely coupled to pixel electrodes the pixels along a second column of pixels from the plurality of pixels

26. (Previously Presented) The method of claim 22 further comprising:
applying a second voltage to the pixel electrodes of the plurality of pixels of the liquid crystal display to initiate a transition of the liquid crystal material in the plurality of pixels to the clear state within a second field; thereafter

applying a second drive voltage to the pixel electrodes of at least one pixel of the plurality of pixels to initiate a transition of liquid crystal material in at least one pixel into a third state within the second color field; thereafter

illuminating at least the one pixel within the second color field.

27. (Previously Presented) The method of claim 26 wherein the first voltage and the second voltage are selected from a range between the first drive voltage and the second drive voltage.

28. (Currently Amended) The method of claim 26 wherein the first voltage and the second voltage are have substantially similar amplitudes.

29. (Previously Presented) The method of claim 26 wherein the first color field and the second color field are within the same frame.

Appl. No. 09/480,986
Amdt. dated [insert date]
Reply to Office Action of February 4, 2004

PATENT

X7 *Cancel*

30. (Previously Presented) The method of claim 26 wherein the first color field and the second color field are selected without replacement from the group: red field, green field, blue field.